Cloud Computing: A Survey on Cloud Simulation Tools

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Abstract

Cloud computing is the trendy topic all over the world. As there are so much service providers of the cloud are available in the competitive world. A decision has to be taken that which service provider's services are more advantageous to the organization. The conceptual cost for buying the services of different services providers may lead to increase in budget or wastage of money and time. So the solution to this problem is trying out the simulation tools. these tools may include the different algorithms used by different service providers. The use of simulation tools leads to decrease in overall conceptual or operational cost of the organizations. There are different simulation tools available in the market. This paper enlists some of the simulation tools used for the purpose of simulation and modeling.
Keywords: Cloud Computing, Simulation Tools, Comparison between simulation tools, Services of Cloud Computing, Components of Cloud Computing

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I. INTRODUCTION

Cloud computing is the term related to the network. Cloud computing refers to hardware and software services are provides over the Internet. Cloud refers to the model, where user can have access to the shared pool of resources such as database servers, applications or storage over the network. This reduces the overall cost to establish an organization and maintenance burden of the different resources; these resources are managed by the service providers. The organization that wants to access these resources just have to pay some little amount to the service providers. This amount is very lesser as compared to purchasing of each resource. People, today, are shifting from traditional computing towards cloud as it provides higher reliability, fault tolerance, broad network access, on demand usage etc [1].

Cloud computing is often used with the term Fog Computing. Fog computing refers to the facility of processing and storing data in the Local Area Networks in conjunction with the cloud computing.

II. COMPONENTS OF CLOUD COMPUTING

The cloud computing encompasses virtual pool of resources and applications that can be used through a self service portal. The components of the cloud computing according to the end user are explained as follows:
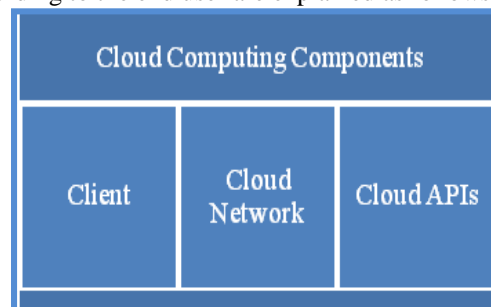

Fig. 1: Components of Cloud Computing

A. *Client:*

A client is a device or software that user can use as an interface to access the services related to clouds.

B. Cloud Network:

It is a network connection between the client and the cloud service providers. The network connection for accessing the services of cloud is so much important. Each and every services of cloud are accessed with a constant network connection.

C. Cloud Application Programming Interface(APIs):

The cloud API includes the set of instructions that abstract the implementation of the cloud service from the users. API helps the programmer to connecting the various cloud services.

III. SERVICE MODELS OF CLOUD COMPUTING

Cloud computing offers three high level cloud service models. These services are selected according to the requirement of the organization. These services are described as follows:

Infrastructure as a Service	Platform as a Service	Software as a Service
• Amazon Web Service • AT&T • IBM • NIT	• Microsoft Azure • Google App Engine • Keynote • Wavemaker	• Salesforce • Google • Microsoft • Ramco

Fig. 2: Services & Service providers of Cloud Computing

A. Infrastructure-as-a-Service (IaaS):

IaaS service provides the hardware services to the user. The services includes in this case is processing power, storage, network bandwidth or other hardware required to setup the computing environment in an organization. When users get access to these resources, he or she can install their operating systems on the provided hardware. The responsibility to maintain hardware security lies on the user.

B. Platform-as-a-Service (PaaS):

PaaS service provides hardware services with operating systems. User just has to install the required applications on those hardware resources. The responsibility to manage the licensing of the software depends on the user of those resources.

C. Software-as-a-Service (SaaS):

In this model the cloud service providers provides the software services to the user. User only needs to run an internet connection to have access to the software. The responsibility of maintaining the licensing of the software depends on the cloud service providers. The customer uses the provider's applications running on cloud infrastructure [3].

IV. SIMULATION TOOLS

Some cloud suffers from significant issues like high monetary cost involved in the cloud resources and also cost of internet for using these resources that may cause many disturbances in the budget of organization. So there is a solution to test the clouds before adopting any cloud services. This solution is Cloud Simulation Tools. The simulation tools contemplate a better option in spite of being real cloud as dispatch experiment is difficult and costly to execute. Effective resource utilization is not possible in the case of cloud

V. ADVANTAGES OF CLOUD SIMULATION TOOLS

Cloud simulation tools offer several advantages over the cloud service. Such as:

A. No Capital Investment Involved

Simulation tools does not requires any installation and nor even maintenance cost

B. Provides Better Results

Simulation tools helps user to change input very easily as when needed, which provide better results as an output

C. Risk are evaluated at earlier stage

Simulation tools involve no capital cost while running as in case of being on cloud. This helps in identifying of risks with design or any parameter at earlier stage.

VI. CLOUD SIMULATION TOOLS

There are various cloud simulation tools available today. Some of them are explained as follows:

A. *CloudSim*

CloudSim is popular simulator developed in CLOUDS Laboratory at university of Melbourne. This simulation tool used in large data centers. The CloudSim toolkit supports both system and behavior modeling of cloud system components such as data centers, Virtual Machines and resource provision policies [2].
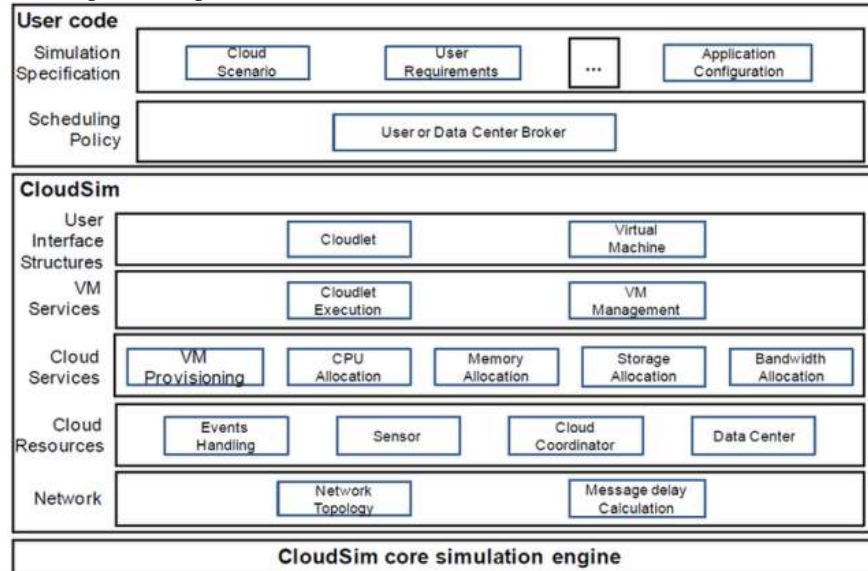

Fig. 1: Architecture of CloudSim

The CloudSim simulator is a layered architecture. The different layers of cloudsim are shown in the above figure.

1) Network Layer: This layer of CloudSim has responsibility to make communication possible between different layers. This layer also identifies how resources in cloud environment are places and managed.
2) Cloud Resources: This layer includes different main resources like datacenters, cloud coordinator (ensures that different resources of the cloud can work in a collaborative way) in the cloud environment.
3) Cloud Services: This layer includes different service provided to the user of cloud services. The various services of clouds include Information as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).
4) User Interface: This layer provides the interaction between user and the simulator.

B. *GDCSim:*

GDC is a Green Data Center Simulator. It combines both modular and large scale entities. Green Datacenter if constructed to run as economically as possible.
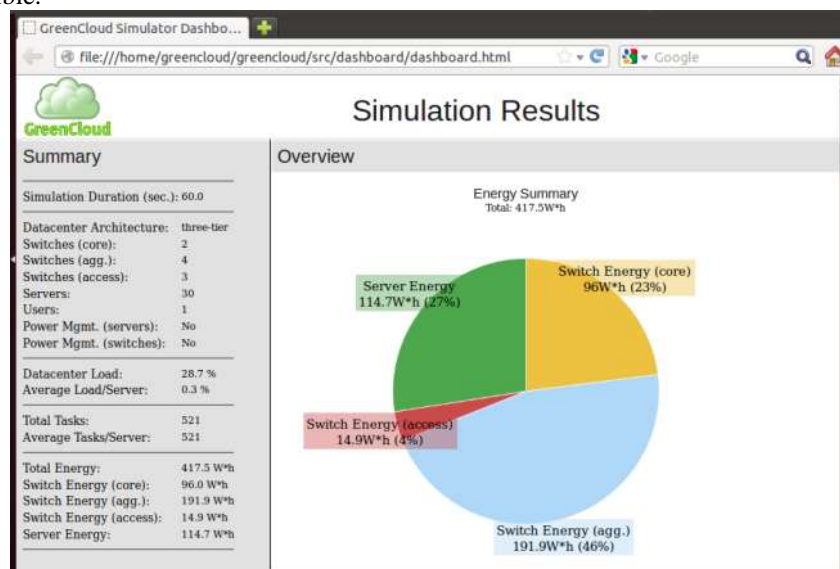

Fig. 2: Green Cloud Simulator view

C. *Cloud Analyst:*

Cloud Analyst is the most popular visualized type of simulators. This tool can be used easily and produces output in graphical format. It creates difference between programming environment and simulation environment.

Fig. 3: Cloud Analyst Simulator

D. *Network Cloud:*

It provides an extension to CloudSim by implementing network layer. It increases the performance of CloudSim. In this simulation tool, each entity is to be mapped with a single BRITE node so that network cloud sim can work properly [1].
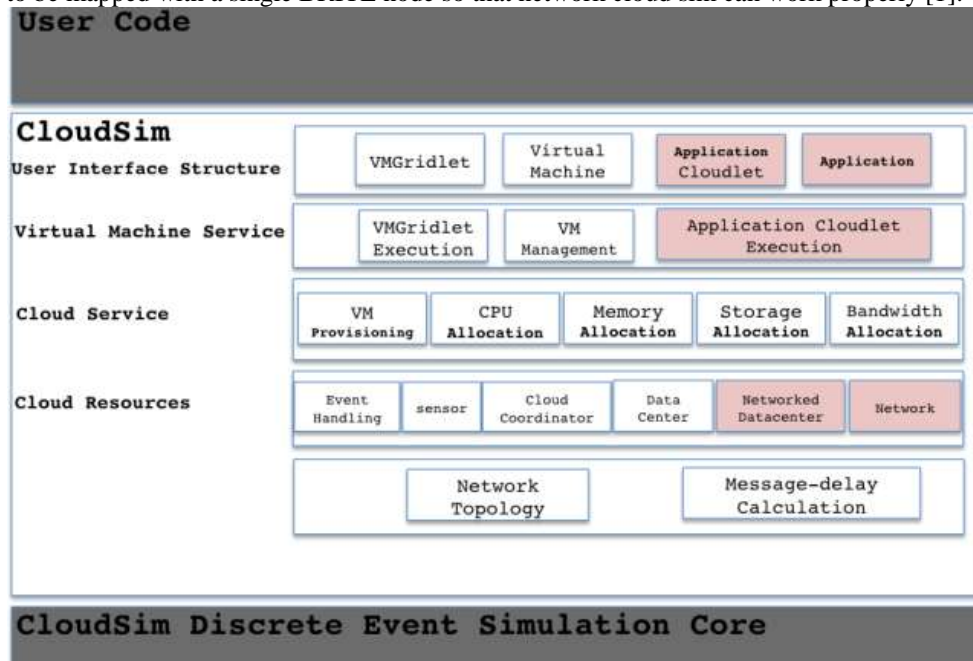

Fig. 4: Network CloudSim

E. *MDCSim*

It is used to analyze and predict the hardware related issues of the servers and data centers.

F. *SPECI Sim*

SPECI is Simulation Program for Elastic Cloud Infrastructure. It is used to analyze the scalability and performance concepts related to data centers.

G. *Ground Sim*

It is an event driven simulator used for grid and cloud servers. It is mostly used for IaaS. It can also be extended for PaaS or SaaS services of cloud.

H. DC Sim

DC is Data Center Simulator, offering IaaS service of cloud and used to develop datacenter techniques.

I. UEC

Ubantu Enterprise Cloud (UEC) is an open stack public cloud. It works with the integration of number of different other open software.

J. iCanCloud

This cloud does not require any modifications when there is requirement to test cloud in different architectures.

VII. COMPARISON OF DIFFERENT CLOUD SIMULATION TOOLS

There are number of cloud simulators available for public use. CloudSim is more demanding over the different types of cloud simulation tools available in the market. It is used for large datacenters. GDC Simulator is able to works with the integration of modular and large datacenters. Cloud Analyst is the most popular visual simulation tool available to handle datacenter in an efficient manner. Network CloudSim extends the CloudSim tool by including network communication features in it. MDC Sim analyze the hardware related issues involved in any type of resource in cloud environment. SPECI simulation tools analyze the increasing power of the datacenters. GroudSim provides the IaaS service of the cloud in simulation tool and may also be used to provide PaaS and SaaS services of the clouds. UEC is the most popular cloud service provider of the Unix. It works with the integration of different software. iCanCloud does not require any modifications when any change in the architecture of cloud occurs.

Table 1
Comparison Of Different Cloud Simulators

Simulator	Programming Language	Networking	Availability
CloudSim	Java	Limited	Open Source
GDC	C++/OTCL	Full	Open Source
Cloud Analyst	Java	Limited	Open Source
Network Cloud	Java	Full	Open Source
MDC	C++/Java	Full	Commercial

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